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**PHILOSOPHICAL
TRANSACTIONS.**

June 20. 1670.

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A Letter of John Evelyn Esq;, to the Right Honourable the Lord Viscount Brouncker, Chancellor to her Majesty and President to the R. Society &c. Concerning the Spanish Sembrador or New Engin for Ploughing, and Equal Sowing &c
L [erts

sorts of Grain, and Harrowing, at once; By which a great quantity of Seed-corn is saved, and a rich increase yearly gained, together with a Description of the Contrivance and Uses of this Engin, English't out of Spanish, and lately presented to the R. Society.

My LORD,

I Cannot devise better how to express my great respects to your Lordship, than by my utmost endeavors to promote the Interest of that *Society*, over which you have so long, with so much ability and affection, and so faithfully Presided. *This* therefore will plead my excuse with your Lordship, if in some confidence of gratifying the generous designs of that Noble Assembly, I communicate to them, through your hands, not only the *Instrument*, (which I herewith present them) but the Description of the *Use* and *Benefit* of it from such a *Deferent*, as I am sure they will very highly value. My Lord, it is now almost two years since, that (by somewhat an odd accident) lighting upon a paper lately printed in *Spanish*, I found a short passage in it, giving notice of a certain *Plough* newly brought out of *Germany* into *Spain*; in both which places it had (upon *Tryal*) so generally obtain'd, as (besides the *Royal Priviledg*, which was granted to the Inventor) to procure the Universal Approbation. Upon this hint, I took the boldness to write to My Lord Ambassador, intreating his Excellency, that, as his more weighty affairs would give him leave, he would not disdain to inform himself more particularly concerning it. *This* his Lordship was not only pleas'd to do, but so highly obliging, as to transmit to me the Engin it self, together with a full Description of it, and its use: All of it written with his own noble Hand, which I do here consecrate to the R. Society, to be inserted among their precious *Cimelia*.

My Lord, being not so happy, as to wait on you my self with it at your publick Assembly this day, I desire, your Lordship will cause these Papers to be read there, and expose the Instrument to their Examination and Tryal. There are many
Gentle-

Gentlemen, who will not be offended with these *Rusticities*, and who know, how highly such *Inventions*, and even *Attempts* have been valued by the greatest and the best of Men. Something (tis possible) may happen to be out of order, by reason of the long Journey it hath passed; but their Ingenious *Curator* will soon be able to reform; and, if need be, improve it. My Lord of *Sandwich* is that Illustrious Person, to whom the *Society* is obliged for this, and many other Favors, and Productions of his own more consummate *Genius*, which enrich their Registers. But, let me tell them, his Lordship hath made, and brought home with him, such other polite Notices and Particulars of *Spain*, and other Forrain Parts, as I know no Person of the most refin'd and publick Spirit, who hath approached him, besides your Lordship: An Emulons and Worthy Example certainly to the rest of our *Noblemen*, and *Ministers* of *State* abroad, who may travel with so many Advantages to inform themselves above Others: And it is to me a shining Instance of both your Lordships happy *Talents*, and great *Comprehension*, that in the throng of so many and so weighty Employments, you can think of Cultivating the *Arts*, and of doubly obliging your Country. How do such *Persons* enamel their *Characters*, and adorne their *Titles* with lasting and permanent honors! This Testimony of my Just Veneration to both your Lordships I could not, upon this Occasion, but superadd, who am

Says-Court

23. Febr. 1672.

My Lord

Your Lordships most humble, most devoted
and most obedient Servant

J. Evelyn.

Follows now the Extract of the Description of this Sembrador, publish'd by Don Joseph Lucatelo Knight, of the Province of Carinthia, a Subject of the House of Austria, Inventor of the Engin, Dedicated to Signor Don Geronimo de Camargo, Councillor of the Consejo Real de Castilla, and of the Hazienda Real, and by Commission of his Catholick Majesty made Judge Protector and Conservador, for the better Distribution, and Direction of the use of the said Instrument.

After the *Inventor* had in the Dedication appeal'd to Don *Geronimo de Camargo* as an Experimental Judge and Eye-witness of the Performances of this Instrument, and taken occasion to celebrate the happiness of the latter Ages upon the account of the *Inventions* of many Excellent things, as the Use of the Loadstone; Gun-powder; Great Ordinance; Printing; the Ordering of Quicksilver to separate the nobler from the baser Metals; the Perfecting of Watches by Pendulums; and many more: After this, I say, it is represented,

First, That both the Ancient and Modern Husbandmen have agreed, that the Perfection of Agriculture consisted in setting the Plants in proportionable spaces, and giving sufficient depth to the Roots, that they may spread enough, to receive that nourishment from the ground, which is necessary to produce and ripen the fruit: For which reason we see, that Plants are set in rows by rule and measure, as the Vine, Olive-trees, and other Fruit-Trees; and in Gardens, the Herbs, and Flowres are planted and sow'd with some order and distinction, so that their over-nearness and the confusion of their Plantation may not hinder their growth.

Secondly, That care hath not been had in the practice of this important part of Husbandry, since even at this day all sorts of Seeds, of Corn and Grain, are sown by handfuls, throwing them out by aime, heedlessly and by chance (counting it too tedious and chargeable to set them one by one in large fields;) whence we see Corn sow'd in some places too thick, in others too thin, and the greater part of it not cover'd, nor deep enough, whereby it is not only expos'd to be eaten by Birds, but also, in Cold Countrys, to be spoyle'd by Frost, and in Hot Regions, by the Sun.

Thirdly, That, upon these Considerations, He (*D. Joseph de Lucatello*) hath, some years since, given himself to invent an Instrument, which with great ease, and with little charge or trouble, sets grain in order and proportion, for the sowing a great quantity of Seed-corn, and enriching the Crop: And that after much Experience he hath perfected and reduced unto practice those *idea's*, producing an Instrument, which being fastn'd to the Plough, at once Ploughes, Soweth, and Har-

Harrows, whereby is saved the labor of the Seeds-man, and the grain falling in order, and in the bottom of the furrow, all of it remains in one and the same distance under ground, so that of five parts of seed, four parts are saved, and then in the Crop is gain'd incredible abundance.

Thirdly, That the Inventor having obtain'd a thing so beneficial to Mankind, thought it reasonable to communicate it to the World under the Patronage of one of its Greatest Monarchs; and so presented it at the feet of his *Catholick Majesty*, who received the Proposition, and caused trial to be made thereof in the *Buen Retiro*, where it did answer expectation, notwithstanding the drought of the year, then much damnifying a'l Corn; an ordinary Husbandman from a measur'd space of ground there, sow'd in the common manner, reaping 5125; where he, by his contrivance, from an equal space of ground there also, reaped 8175; besides the seed saved in the sowing.

Fourthly, That thereupon his said *Catholick Majesty* did grant to the Inventor the Priviledge, That he only and his Assignes may make and distribute these Instruments in all the Kingdoms and Provinces of that Monarchy in Europe, at the price of 24 *Rials Plate*, each, and out of Europe, 32 *Rials Plate*; of which the fifth part should be paid to the King; prohibiting also to all, that have not the leave of the Inventor or of persons authorized by him, the making of this Instrument, under the penalty of 1000 *Escud. d'oro*, to those that are able to pay it, and to others, that are unable, other punishment equivalent thereunto: And not only those, that make it, but such also, as buy and use it, are lyable to the same penalties, which are to be divided into three parts, $\frac{1}{3}$ to the *Camera*, $\frac{1}{3}$ to the Judge, and $\frac{1}{3}$ to the Informer.

Fifthly, That for the better Execution hereof, and provision in all Cases that may happen for the introduction and Conservation of this Instrument, his *Catholick Majesty* hath nominated *D. Geronimo de Camargo*, for Judge *Conservador*, with full power to depute such persons, as he shall think fit, within and without *Spain*, for the exercise of his Authority, and for receiving his Majesties due upon this Licence.

Sixthly,

Sixthly, That before the *Inventor* came to the Court of *Spain*, he made divers Tryals in his own Country, wherein he succeeded according to wish; and thereupon made the great tryal of this Engin before his present Imperial Majesty, in the fields of *Luxembourg* in *Austria*, where the land usually yields four or five fold; but the Crop from the ground sow'd with this Instrument was *sixty* fold, as appears by a Certificate given in *Vienna Aug. 1. 1663.* It. n. by an Officer of the Emperor, appointed to see the said ground sowed and reaped: which Certificate was thought needless to insert here *verbatim*.

Seventhly, That this Priviledge being dispatch't and the Seed-time then approaching, he (the *Inventor*) forthwith publisht his Contrivance, and Instructions, as follows;

1. There is a Box of Wood, having a Cylinder or Roler passing at each end into two wheels, set about with strong nails, and divided into three equal parts, surrounded upon the lines of division with little Bras-spoons. equally distant from one another, so as each of them in one row is posited over against the middle of the opposite interstice of the other row; which Spoons in the turning of the Instrument take up, each, one single grain at a time, and throw it out at certain holes, into the ploughed ground. The parts of it are these: In the first *Plate*, representing this *Sembrador*, *Fig. I.* shows the Intire Box without the Wheels; *a b c d* the cover of that part, where the Corn is put in, which is open in *Fig. I.* at *W.* And *e f h g k l.* the two sides which cover that part of the Box, where the Cylinder, which is stuck round with three rows of little spoons, is moved about to throw out the Corn; which sides are taken off in *Fig. 2.* to make the Cylinder *RS* with the Spoons *x x x* appear: the inner shape of which sides is express'd in *Fig. 3*; where may be seen the four Triangular pieces *p p p p*, leaving Triangular interstices *q q q*, which serve to convey the Corn carryed up in the Spoons, and discharged at the top of the Cylinder, so as they may just run out at the holes underneath the Box, the parts of which answer to the parts of the first *Figure* according to the letter. *T.* is one of the Wheels; *V*, the other end of the Cylinder, upon which the other wheel is to be placed.

2. This *Sembrador* must be tyed fast to the Plough, in the man-

manner as is seen in *Fig. 4*; so that the Corn may fall in the furrow, and, at the turning of the Plough, the Ears of the Plough may cover the Corn of the last furrow with earth.

3. Because the Seed sow'd by this *Instrument*, is plac'd in a convenient depth, *viz.* in the bottom of the furrow, whereas the seed scattered the comon way remains nearer the superficies of the Earth, or quite uncovered, therefore it must needs shoot forth somewhat later; so that it is requisite, the Husbandman, using this *Instrument*, should sow 8 or 10 days sooner than the accusom'd Seed-time (that the Corn may sprout forth on the face of the Earth in convenient time) and make an end of sowing with the same as many days before others; *viz.* beginning to sow in the middle of *September*, and making an end at the middle of *November*.

4. In stiff ground the furrows ought to be 5 or 6 inches deep; in middle sort of ground, 6 or 7; and in light and sandy ground, 7 or 8 inches; and according to this proportion the husbandman must govern himself deepning or showling the Plough, as the condition of the land shall require.

5. Especial care must be had, that the Wheels of the side of the *Instrument* do always turne round, and never drag along without turning; as also, that the Ears of the Plough be made somewhat bigger then the ordinary ones.

6. 'Tis also convenient, that the Seed be well sifted and clean'd, that so the litle Spoons may every time take up a grain, and the Seed be the better distributed.

7. In *Barley* 'tis to be well observed, that it be made clean in that manner that the straw and beards be broken off as near the grain as may be, that so they hinder not the issuing of the grain out of the *Instrument*.

8. After Seeds-time done, furrows must be made to drain the land of water, according to the use of each Country, without doing any thing more extraordinary, until the Harvest.

This *Instrument* and these Instructions being thus made publick, many persons, expecting great benefit from it in Husbandry, came to *Madrid A. 1664.* to buy this *Instrument* at the price of three *Rials of 8. Plate*; which then seemed a rate proportionable for the charge of making the *Instrument*, and the
Inven-

Inventors gain. And so they made tryal in many parts of *Spain*, where they found the truth of what was promised by the Inventor, and discovered no other defect of the Instrument, than the slightness thereof, and its not being durable enough. To remedy which inconvenience, *Don Geronimo de Gamargo* was personally to view some grounds near *Madrid* sowed by this Instrument, the better to inform his Majesty of the Condition and success of them, and how it was necessary somewhat to increase the price of the Instrument, that it might be made stronger and more durable. And His Majesty was pleased to add one piece of 8. to the former price; whereby the Instrument is notably improved and bettered; the little Spoons, which at first were of Tin, are now of Brass, and bigger than before, and more in number: The Wheels also are made bigger, and more substantial, and the Iron-plates likewise, together with the Nails of the Wheels, and Clouts of Iron and Rings of Brass, to save the Axel-trees from wearing.

And that the Husbandman may the more understandingly use hereafter this *Sembrador*, and with greater ease, here are added more large *Instructions* than those, that were published the last year.

Larger Instructions for the Use of the New Sembrador.

1. Before they sow the ground, they must give it so many tilths as is accustomed in that Country where the Land lyeth; concerning which tis needless to enlarge, since every ploughman knows it to be one of the fundamental rules for having a good Crop, to plough the ground three or four times, thereby to reduce the Land into mould, to kill and pucker out the weeds, and to break the clods.

2. When they go about to sow, the Ploughman must begin to open a furrow with the Plough for one or two paces, and when the Plough is well in the ground in a convenient depth, then they must tie the *Sembrador* to the Plough-beam (as was mentioned above in the shorter Instructions,) so that the wheels and the nails in them stand upon the ground, and the bindings of the rings must be very hard, and in the manner expressed in the *Picture*: So shall the wheels move always, and the Instrument not reel, but move equally, whereby it will sow with
better

better order and proportion: And this very strong tying it to the Plough, so that it may not wrest any way, will also make it sow with the same order and equality over Hills, as also over rough uneven grounds, as over the smoothest.

3. The Ears of the Plough are to be made larger, than hitherto; whence two advantages will arise: 1. It will better cover the furrows when sown; and make wider furrows to receive the seed, when they do sow. 2. Those larger Ears will prevent the blows, the great Clods and Stones will give the *Sembrador* (if the Clods be not broken, and the Stones pick't out.) But when there are such great Stones in the Land, as the Plough cannot penetrate, then the Plough-man by lifting up his plough must pass over it, until he meets with mould again; and so must the *Sembrador* also be lifted up, the weight thereof being but very little, and no considerable trouble to the Plough-man.

4. When the Clodds and Stones cannot be master'd with only one pair of Ears, you must add another pair of them to the Plough, four or five inches higher than the first (choosing a fit place in the beam to place them in,) although behind the others a little; for so the *Sembrador* will be perfectly saved and defended. And the second Ears are to be of the same bigness with the first. And this is found by Experience to be the best remedy against the Stones and Clodds.

5. The Time of Sowing, according to the most experienced Farmers, is, when the mould of the Land is dry, or but a little inclining to moisture: In either of which conditions of the Land, this new *Sembrador* works without clogging the wheels, or stopping up with dirt those holes, through which the grain is to issue forth. And to sow land, when 'tis dirty and full of water, is very hurtful to the Farmer, who then loses his Seed, and the pains of tilling, and the Crop. And this *Sembrador* may serve for a means to try, when the Land is in good temper to be sown, viz. when the wheels of the Instrument will move equally, and without hindrance or clogging with dirt. And when the wheels will not turn round because of the clay and over-much moisture, it is a signe, that 'tis not fit for cultivation, until it ungive and be dry.

6. When 'tis time to sow, the Corn must be very well clean'd, and especially the Barley, as was noted in the former Instructions.

7. To know, when this *Sembrador* works best and most equally, you are to observe the quantity of Seed it sows upon an *Hanega* * or half an *Hanega* of Land :

* *Hanega is as much Land, (by the information of Inquisitive Travellers in Spain) as will take about 1 $\frac{1}{2}$ bushel of English measure, after the common way of sowing.*

A Celamine is about $\frac{1}{12}$ part of an English bushel.

for if it work as it ought to do, it will sow three *Celamines* of Wheat (a little more or less) and five *Celamines* of Barley in every *Hanega* of Land. And if it much exceed or fail of this proportion, it noteth some fault in the Instrument, or carelessness in the Plough-man; which is very easy to discover, especially from any impediment in the wheels, which ought al-

ways to turn round, and not to drag, because upon their motion the Sowing wholly depends, and without it there will not one grain be sown.

And this care and observation must be in all other Seeds, proportionably to their bigness; noting that for the bigger sort of Seeds, such as are *Garavancas* (or Rounsfals) *Lupins* and other such like, there must be *Sembradors* made with bigger Spoons; as there are to be made others with lesser Spoons for the sowing of *Rye*, *Millet*, and other lesser Seeds.

8. How to manage the *Plough* in stiff or light ground, was noted in No. 3- of the former *Instructions*.

9. When you sow, you must plough the furrows very close one to another, that so the Plough, when it turns back, may the better cover the last furrow, which is left open, and sow'd as it came along.

10. The Plough-beam and Plough-tail are to be governed straight, without wrinching any way, that so the *Sembrador* may follow straight, and without going awry, and sow the grain in better order.

11. After having sown the Land in the said manner, the Land should be made as plain as can be, and no such furrows made to carry away the water, as hitherto hath been used; but it will be sufficient, that at every four yards distance (one from the other

other) furrows be made : For, Experience hath taught us, that the Land laid up without furrows bears more Corn, than that which hath more furrows ; because the Wheat and Barley, and other Plants receive greatest damage by drought : And therefore this ought more especially to be observed in *Spain*, one of the dryest Country of *Europe*.

12. In many parts of *Spain* in 1664. it was found, that Land sown in *September* hath yielded a better Crop, then that which was sow'd in *October*; and that sown in *October*, better than that sown in *November* : Which proveth, that 'tis more advantageous to sow early, then late.

13. They have observ'd also, That it is very profitable to sow in the *New Moon*, because it will shoot forth, and thrive, and ripen sooner. This is understood for those, who till but a little Land, and so can chuse their own time to sow ; but those that plough great quantities, can lose no time nor season in sowing. And in *Spain* they may begin the first *New Moon* in *September*, and so go on, and end with the *New Moon* in *November*. And in *Italy* they may do in the same manner, as also in the Islands of the *Mediterranean*. But in *Germany* and the *Low Countries*, they begin in the end of *August*, and end with the *New Moon* of *October*.

So far this Account. If any desire to see this *Instrument*, he may inquire for the *Curator* of the *R. Society* (Mr. Hook,) or for their *Operator* Mr. *Shortgrave*, in *Gresham Colledg*, the latter of whom will also, in all likelyhood, be ready to provide the *Engine* itself for those, who shall please to make use of it.

An Account of the Observation, made by the Philosophical Academy at Paris, May 12 1667 about 9. of the Clec^{ks} in the morning, of an Halo or Circle about the Sun; together with a Discourse of M. Hugens de Zullichem, concerning the Cause of these Meteors, as also that of Parelia's or Mock-Suns. Englished out of French by the Publisher, to whom it was sent but lately from the worthy Author of the said Discourse.

THE Diameter of this Circle, which was exactly observ'd, was found to be of 44 degrees, and the breadth of the Limb thereof, of about half a degree. The upper and lower part were of a vivid red and Jellow, with a little purple-colour

